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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/577,104	04/25/2006	Herbert Friedrich Boerner	DE 030368	1148
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EXAMINER				
GREEN, TRACEY Y				
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2879				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/577,104

Applicant(s)

BOERNER ET AL.

Examiner

TRACIE Y. GREEN

Art Unit

2879

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07/21/2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 4-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

DETAILED ACTION

Response to Amendment

1. Receipt is acknowledged of applicant's amendment filed 07/21/2008. Claims 1-2, 4-16 are pending and an action on the merits is as follows.
2. Applicant's amendments with respect to claim 1 and newly added claims 8-16 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-7 and 16 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically in claim 1, applicant claims a first hole transport layer and a first blocking layer and "a layer structure comprising at least one further hole transport layer and at least one further hole blocking layer arranged between the first hole transport layer and the anode", then in claim 2 the applicant claims "a second hole blocking layer". It is unclear as to how many hole blocking layers the applicant is trying to claim. For purposes of examination, examiner will assume applicant is claiming a first hole blocking layer between the hole transport layer and the light-emitting layer, and a second blocking layer as recited in claim 2, with no other blocking layers present. Office action on merits follows.

5. Claims 11-12 recites the limitation "a first distance and third distance" (claim 11) and "a third distance and second distance" (claim 13). There is insufficient antecedent basis for this limitation in the claim.
6. Regarding claims 15-16, the phrase "approximately equivalent" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d). For purposes of examination, Examiner has taken the prior art reference to meet this limitation. Office action on merits follows.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 8-9 and 14-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Thompson et al. (US 2003/0068528 A1).

Regarding claim 8, Thompson et al. (Thompson, hereafter teaches) a light-emitting device comprising: an electroluminescent layer (ETL) for emitting light when excited; a hole transport layer (HTL) for facilitating injection of holes into the electroluminescent layer; (Paragraph 13 and 34) a hole blocking layer (EBL), located between the electroluminescent layer and the hole transport layer, for preventing injection of holes into the electroluminescent layer, wherein a first highest occupied molecular orbital (HOMO) energy level of the hole blocking layer is lower than a second HOMO energy

level of the hole transport layer (Paragraph 82) (*Examiner note: prior art teaches a HTL/LEL layer in which the dopant is the transport layer, prior art teaches the HOMO energy level being lower than this dopant, thus satisfying this claim*)

Regarding claim 9, Thompson teaches wherein the first HOMO energy level of the hole blocking layer is lower than a third HOMO energy level of the electroluminescent layer (Paragraph 27, lines 1-10).

Regarding claim 14, Thompson teaches wherein the hole blocking layer has a thickness of less than or equal to 10 nm (Paragraph 80, lines 9-13) (*Examiner note: prior art reference teaches this layer to be between 50-1000 angstroms= 5-100nm*)

Regarding claim 15, *this claim is drawn to a method of operating and does not provide any particular structural limitations; therefore this claim is not considered germane to the applicant's invention as currently claimed*)

Claim Rejections - 35 USC § 102 and 103

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1-2, 4-7 and 16 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Wu et al. (US 2005/0040392 A1).

Regarding claim 1, Wu et al. teaches (Figure 6A -6D) light-emitting device(2), comprising at least a substrate (Paragraph 53, lines 1-5), an anode (10), a first hole transport layer (635), a light-emitting layer (639) and a cathode (14), wherein a first hole blocking layer (637) is arranged between the first hole transport layer (635) and the light-emitting layer (639); a layer structure consisting of at least one further hole blocking layer (633) and one further hole transport layer (631) is arranged between the first hole transport layer (635) and the anode (10)

Regarding claim 2, Wu et al. teaches wherein a second hole blocking layer (613) is arranged between the cathode (14) and the light-emitting layer (611).

Regarding claim 4, Wu et al. teaches (Figure 6c) that the further hole blocking layers (633,637) and hole transport layers (631,635) are arranged in an alternating manner.

Regarding claim 5, Wu et al. teaches wherein the oxidation potential of the material of a hole blocking layer (135) is higher than the oxidation potential of an adjoining hole transport layer (131, TATE). *(Examiner note the material disclosed by prior art is BCP which is a material that the applicant also uses as well as the TATE, as such examiner takes the position that this requirement is therefore satisfied)*

Regarding claim 6, Wu et al. teaches wherein the material of a hole blocking layer is selected from the group consisting of 2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline (Bathocuproin, BCP), 3-(4-biphenyl)-4-phenyl-5-tert-butylphenyl-1,2,4-triazole (TAZ), 2-(4-biphenyl)-5-(p-tert-butylphenyl)-1,3,4-oxadiazole (tBu-PBD), 2-(4-biphenyl)-5-(4-tert-butylphenyl)-1,2,4-oxadiazole (PBD), 1,3,5-tris-(1-phenyl-1H-benzimidazol-2-yl)benzene (TBPI) and oligophenyls with perfluorinated side chains (Figure 7, BCP). *(Examiner note the material disclosed by prior art is BCP which is a material that the applicant also uses as well as the TATE, as such examiner takes the position that this requirement is therefore satisfied)*

Regarding claim 7, Wu et al. teaches (Figure 6a) wherein an electron transport layer (619) is arranged between cathode (14) and light-emitting layer (615).

Regarding claim 16, *this claim is drawn to a method of operating and does not provide any particular structural limitations; therefore this claim is not considered germane to the applicant's invention as currently claimed)*

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson et al. (US 2003/0068528 A1).

Regarding claims 10-11, Thompson teaches the materials as disclosed in the applicant's specification (Page 4, lines 1-6 and 20-24, Page 5, lines 20-25). Thompson discloses Irppy (light-emitting material) (Paragraph 88), BCP(HBL material) (Paragraph 90) and PDOT (HTL) (Paragraph 90). Thompson further teaches the relationships of the HOMO and LUMO characteristics (Paragraphs 80 and 81 and 88, 90) of the these three layers along with the relationship of between these different layers in order to provide a device that is stable towards oxidation, has increased life span and improved overall efficiency (Paragraph 11, lines 1-6 and Paragraph 12).

Therefore one of ordinary skill in the art at the time of the invention could modify the light emitting device of Thompson wherein a first distance between the highest occupied molecular orbital (HOMO) and the lowest occupied molecular orbital (LUMO) of the hole blocking layer is greater than a second distance between the HOMO and the LUMO of the electroluminescent layer and a third distance between the HOMO and the LUMO of the hole transport layer is greater than the second distance between the HOMO and the LUMO of the electroluminescent layer in order to provide a device that is stable towards oxidation, has increased life span and improved overall efficiency as taught by Thompson.

Regarding claim 12, Thompson teaches wherein the hole transport layer comprises a material having a low ionization potential with a low electron affinity (Paragraph 76) *(Examiner note the material disclosed by prior art in cited paragraph is a material that the applicant also discusses in pages 4-5 of the specification, as such examiner believes this requirement is therefore satisfied*

14. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson et al. (US 2003/0068528 A1) in view of Forrest et al. (US 6,451,415 B1)

Thompson teaches the light -emitting device set forth above (see rejection claim 8). Thompson is silent regarding at least one second hole transport layer and at least one second hole blocking layer, located between the hole blocking layer and the electroluminescent layer, wherein the at least one second hole transport layer and the at least one second hole blocking layer are arranged in an alternating manner.

In the same field of endeavor of light-emitting devices, Forrest et al. teaches (Figure 2D) wherein plurality of hole transport layers (2D02) and a plurality of hole blocking layers (2D03) are arranged in an alternating manner in order to provide a device with improved internal and external quantum efficiencies (Column 6, lines 64-67).

Therefore one of ordinary skill in the art at the time of the invention could modify the light emitting device of Thompson at least one second hole transport layer and at least one second hole blocking layer, located between the hole blocking layer and the electroluminescent layer, wherein the at least one second hole transport layer and the at least one second hole blocking layer are arranged in an alternating manner in order to provide a device with improved internal and external quantum efficiencies as taught by Forrest et al.

Response to Arguments

15. Applicant's arguments with respect to claims 1 and 8-16 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 2003/0198831 A1 discloses blocking and transporting layers arranged in alternating manner.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRACIE Y. GREEN whose telephone number is (571)270-3104. The examiner can normally be reached on Monday-Thursday, 7:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 571/272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

/Tracie Y Green/
Examiner, Art Unit 2879

/Sikha Roy/
Primary Examiner, Art Unit 2879